AVES-301224

December 1996

WORK PLAN
for a

LIMITED SOIL GAS SURVEY
at the
CITY OF INDUSTRY, CALIFORNIA
FORMER JOHNSON CONTROLS FACILITY

for

Johnson Controls, Inc.
49200 Halyard Drive
Plymouth, Michigan 48170

for Submittal to

California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91754-2156

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Section 1

PROJECT OVERVIEW AND SITE HISTORY

1.1 PROJECT BACKGROUND

In March and April 1991, Triad Geotechnical Consultants, Inc. performed a contaminated soil investigation at the Johnson Controls, Inc. (JCI) facility at 315 South 7th Street, City of Industry, California. The soils analyses at one sampling site (identified as 10 @ 1 feet below ground surface) along the Northeast side of the building indicated Tetrachlorethylene (PCE) and 1,1,1-Trichlorethane (TCA) in the soil at concentrations of 257 and 37 ug/kg, respectively. In March 1993, Environmental Support Technologies, Inc. (EST) performed a soil gas survey at the JCI City of Industry site and submitted a Soil Gas Survey Report dated March 31, 1993. Soil gas samples collected by EST indicated elevated concentrations of PCE and TCA as well as Trichlorethene (TCE) and 1,1-Dichlorethane (DCA). Subsequently, JCI received a letter from the Los Angeles Regional Water Quality Control Board (LARWQCB) dated October 31, 1996, which pointed out some QA/QC problems with the EST Soil Gas Report data and requested that an additional limited soil gas survey be performed to verify the EST data and to characterize the soils in several additional areas of concern. JCI selected AeroVironment Environmental Services, Inc. (AVES), to perform this limited soil gas survey. This Work Plan is the AVES proposed approach to meeting the requirements of LARWQCB for the JCI City of Industry facility.

1.2 SITE INFORMATION

The Johnson Controls, Inc. facility (the Site) is located at 315 South 7th Avenue in the City of Industry, in the Puente Valley groundwater Superfund area. The Site is occupied by a 250,000 square feet building that was formerly used by JCI for manufacturing polythylene terephthalate (PET) beverage containers. Figure 1 in Attachment A provides a plan view layout of the JCI City of Industry Facility. On-site processes included blow molding, labeling, packaging, and warehouse storage. JCI ceased manufacturing at City of Industry in 1995 and has used the site only for limited storage since then.

Section 2

TECHNICAL APPROACH FOR THE SOIL GAS SURVEY

The limited soil gas survey at the Johnson Controls Site in the City of Industry will be conducted in accordance with the LARWQCB Quality Assurance and Quality Control (QA/QC) procedures and reporting requirements for a Soil Gas Investigations. These requirements are detailed in the RWQCB's *Work Plan Requirements for Active Soil Gas Investigations Well Investigation Program (WIP)* dated March 1996. Field activities will be conducted in accordance with standard established AVES active soil gas survey protocols as incorporated below. A site-specific Health and Safety Plan has been developed for this project.

2.1 OBJECTIVES OF THE SOIL GAS SURVEY

The objectives of the proposed limited soil gas survey are as follows:

- Confirm the results of the previous EST soil gas survey regarding the condition of the JCI Site.
- Complete the evaluation of the vadose zone at the Site by soil gas survey in compliance with the objectives of the LARWQCB WIP.
- Provide a Contingency Plan to expedite a more extensive soil gas survey if justified by the results of the limited soil gas survey.
- Meet the QA/QC requirements of the LARWQCB for soil gas surveys.

AeroVironment Environmental Services Inc. (AVES) proposes to perform a limited soil gas survey at Johnson Controls in City of Industry as specified in Dr. Heath's letter and in accordance with the RWQCB's *Work Plan Requirements for Active Soil Gas Investigations Well Investigation Program (WIP)* dated March 1996. In addition, we have provided as part of this Work Plan a Contingency Plan on how AVES would expedite a more extensive soil gas survey if the results of the limited soil gas survey indicate the need for horizontal and/or vertical delineation of contamination. We have also provided the Soil Gas Survey Procedures we will employ and our Quality Assurance/Quality Control QA/QC procedures.

To meet the first and second requirements, AeroVironment Environmental Services Inc. (AVES) will perform shallow soil gas surveys at 22 locations as identified:

1. Resampling - Install and sample 5 and 15 feet below ground surface (bgs) soil gas probes at previous EST soil gas sampling locations SG-1, -3, -4, 7, -10 and -15.
2. Clarifier - Install and sample one 15 feet bgs soil gas probes at inlet/outlet
3. Former Hazardous Chemical Storage Area - Install and sample two 5 feet bgs soil gas probes.
4. Former Compressor Room - Install and sample three 10 feet bgs soil gas probes.

5. Room adjacent to former Compressor Room - Install and sample three 10 feet bgs soil gas probes and one 20 feet bgs soil gas probe.
6. Floor Drains - Install and sample one 10 feet bgs soil gas probe at each of 3 floor drains.
7. Sump southeast of Former Grinding Room - Install and sample two 15 feet bgs soil gas probes.
8. Sump in southwest Section of Building - Install and sample one 10 feet bgs soil gas probe.

2.2 SHALLOW SOIL GAS SAMPLING SURVEY

The limited soil gas survey will verify the results of the 1993 EST soil gas survey and will confirm the overall condition of the Site by surveying additional areas of concern specifically (clarifiers, sumps, and floor drains) throughout the building. The locations of the soil gas survey sampling points are shown in Figure 1, Survey Sampling Locations, in Attachment A. A number of these sampling points are new (for instance, the former hazardous chemical storage area) but many are reoccupying soil gas sampling locations of the 1993 EST survey. This concurrence of sites will provide a "calibration" of the two surveys and the QA/QC of the 1993 EST survey. AeroVironment Environmental Services will plan, supervise, and document all soil sampling and soil analysis activities. Mobile analytical laboratory services for this soil gas survey will be provided by Hydro Geo Spectrum, a LARWQCB-approved company for soil gas surveys.

2.2.1 - Shallow Soil Gas Sampling Procedures Outside Buildings

A truck-mounted percussive device (*MeisterProbe, Geoprobe* or similar device) will be used to advance one-inch 4130 steel probes fitted with a drop-off well point to depth; the probe will be withdrawn approximately six inches to one foot, allowing the well point to drop off exposing the annulus on the bottom of the probe from which sample will be obtained. A 5/16 inch polyethylene tube will be inserted to depth inside the steel pipe and "anchored" at depth to a sand pack. The metal tube will be withdrawn, grouting as the pipe is withdrawn. The polyethylene tubing is connected to a glass sampling bulb fitted with Teflon stopcocks and a viton septum through which sample is withdrawn for analysis. The rest of the sampling train consists of a vacuum gauge, flowmeter, and portable sampling pump. The entire sampling train is leak-checked, and an *equipment blank* is collected. After recovering the sample, isotopically-labeled surrogates are added to ensure quantitative recovery from the sampling container. A four-hour holding time, assuming greater than 90% surrogate recovery, has been determined to be acceptable by the LARWQCB. The sample is then delivered to the mobile laboratory for analysis.

Shallow gas locations inside building at the JCI Facility will be installed manually. A small hole is drilled through the concrete floor using a rotary percussion hammer. A slam bar or slide hammer is used to drive a small copper probe into the soil below the floor to the desired depth (5 feet). The copper probe is (1/4-inch outer diameter) lined

with 1/8-inch Teflon tubing. When the tip of the probe is at the desired depth, the Teflon tubing is withdrawn, releasing a gas seal at the bottom, and thus exposing the sampling train to an open annulus at a depth of 4-5 feet. This tubing is connected to the sampling apparatus. Alternatively, the larger bore tubing can be installed using a large rotary hammer, and withdrawing as with the *MeisterProbe* using a specially-constructed jack.

In order to ensure that a representative soil gas sample is collected, it is necessary to ensure that the ambient air is purged from the sampling probe; on the other hand, one must avoid high gas flow rates or extended sampling time so as to prevent air-stripping and other non-equilibrium effects as well as maintaining the sphere of influence to a reasonable volume around the sampling point.

We will maintain a flow rate of about 150 ml/min, samples will be collected after three purge volumes are removed for most compounds in most sediments, while PCE and other compounds may require up to ten purge volumes. We will perform our standard test at 150 ml/min, for the following purge volumes: 2, 5, 10 and 20. To ensure useable data, we will wait until we get our first *detect* before performing the test; if the seven to ten purge volumes that we had been using up to this point proves invalid, those points will be repeated. If no compounds are detected on the site, a representative location will be chosen.

Soil gas samples will be analyzed in compliance with the LARWQCB protocol of March of 1996 using a Hewlett-Packard model 5890 gas chromatograph interfaced to a model 5972 mass spectrometer.

2.2.2 Shallow Soil Gas Sampling Procedures Inside Buildings

Shallow gas locations inside building at the JCI Site will be installed manually. A small hole is drilled through the concrete floor using a rotary percussion hammer. A slam bar or slide hammer is used to drivel a small copper probe into the soil below the floor to the desired depth (5 feet). The copper probe is (1/4-inch outer diameter) lined with 1/8-inch Teflon tubing. When the tip of the probe is at the desired depth, the Teflon tubing is withdrawn, releasing a gas seal at the bottom, and thus exposing the sampling train to an open annulus at a depth of 4-5 feet. This tubing is connected to the sampling apparatus as in the deep-probe methodology. Alternatively, the larger bore tubing can be installed using a large rotary hammer, and withdrawing as with the *MeisterProbe* using a specially-constructed jack.

In order to ensure that a representative soil gas sample is collected, it is necessary to ensure that the ambient air is purged from the sampling probe; on the other hand, one must avoid high gas flow rates or extended sampling time so as to prevent air-stripping and other non-equilibrium effects as well as maintaining the sphere of influence to a reasonable volume around the sampling point.

We will maintain a flow rate of about 150 ml/min, samples will be collected after three purge volumes are removed for most compounds in most sediments, while PCE and other compounds may require up to ten purge volumes. We will perform our standard test at 150 ml/min, for the following purge volumes: 2, 5, 10 and 20. To ensure useable data, we will wait until we get our first *detect* before performing the test; if the seven to ten purge volumes that we had been using up to this point proves invalid, those points will be repeated. If no compounds are detected on the site, a representative location will be chosen.

Soil gas samples will be analyzed in compliance with the LARWQCB protocol of March of 1996 using a Hewlett-Packard model 5890 gas chromatograph interfaced to a model 5972 mass spectrometer.

2.3 CONTINGENCY SAMPLING PLAN

In the event that analysis of any of the soil gas probe samples detects volatile organic compounds (VOC), and, in particular, detect the target compounds at the JCI Site (PCE, TCE, TCA and 1,1-DCA) then a Contingency Plan of "stepping out" for more samples would be implemented. The purpose of this Contingency Plan would be to quickly and cost-effectively delineate, both horizontally and vertically, and document the extent of any VOC detected in the soil. In each step-out, additional samples would be taken at spacings of approximately 10 feet in East, West, North and South directions from the original probe location and at the same depth as the original. If the VOC is detected in the upper probe of a pair of soil gas probes at the original location, but the lower probe shows a significant decrease in VOC concentrations then no additional, deeper probes will be required. If the VOC is detected in the only or in the lowest probe at a sampling location, then another probe would be inserted to a depth 10 feet below the original probe and sampled. All additional step out (and down) probes would be sampled and the samples analyzed on-site by the mobile laboratory. If no decreases in VOC concentrations are observed, then the procedure would be repeated as necessary to expand the grid of sampling locations until the original VOC detected is surrounded by decreasing concentrations - vertically as well as horizontally.

Section 3

QUALITY ASSURANCE/QUALITY CONTROL

3.1 SOIL GAS SAMPLING

The main concern is that soil gas are collected from the desired depth and that a representative sample of the soil gas is collected. Therefore leakage in the sampling train, contamination from other sources (such as a previous site), and sorption must be controlled.

One tests for leakage as follows: before installation into the ground, all connections are made exactly as when the probe is installed, the 'bottom' end of the Teflon tubing is sealed, and the absence of flow is verified with all valves and stopcocks open and the pump running. This leaves the sampling bulb under a partial vacuum. After installation, the pump is turned on, the pump-side stopcock of the gas sampling bulb is opened, and "no-flow" again verified. The stopcock on the sample side is then opened, and flow is monitored during the sampling: initial and final flow are both recorded in the field logbook.

With shallow probes, the only other 'connection' is the rubber stopper holding the copper tubing in the hole at the surface. This is completely covered with bentonite slurry to prevent leakage.

An additional test for leakage is performed at least once during the project: a small shallow container of pentane is placed next to the probe, the entire apparatus is covered by either a large bucket or tarp, and sampling is initiated. Leakage will be evidenced by the presence of analytical grade pentane in the sample.

3.2 ANALYSIS

Quantitation will be effected by the use of external standards; a five-point initial calibration will be run, then daily calibration check standards will be used to verify response factor stability. A *Laboratory Control Standard* will be analyzed at the end of each day to verify stability during the analysis day.

Analytical blanks, usually ambient air, or ultrapure nitrogen when necessary, will be analyzed after standards, and after any sample where the possibility of 'carryover' exists. Sample train blanks will be analyzed as required, usually one per day. One representative site will be re-sampled at various times in the program, as often as once per day, to establish method confidence. Detection limits are at 1 ug/l or lower for all analytes.

Sample bulks will be baked out at 200 degrees Celsius, then flushed while hot with ultrapure nitrogen or air. Sample bulbs will then be analyzed to verify cleanliness.

Sample bulbs will be labeled with a distinct numbering system and recorded in the field log books as well as the sample entry/run log book in the mobile laboratory and printed on the quantitation sheets.

The gas-tight syringes used to withdraw the sample from the bulb will be leak-checked before each use by closing the exit valve and attempting to force ambient air through the needle.

A field log book will be maintained by the samplers and updated immediately after each sample is collected. It will include the sample collecting time, date, weather, soil conditions, and any other pertinent information.

A sample collection sheet will be filled in by the sampler for each sample taken, and will serve additionally as a chain of custody record between the field crew and the chemist. A unique laboratory identification number will be assigned to each sample by the chemist, and will be associated with the field number assigned by the sampling team. Three surrogates will be spiked into the gas sample bulb immediately after the sample is taken:

i. D6-Acetone. This measures the recovery of the water-soluble chemicals in the soil gas. Previous to the introduction of this surrogate, the detection of condensed water gas on the sides of the vessel was the only indication of possible problems. Since the use of this surrogate, condensed water is usually accompanied by less than a 50% recovery of many of the target compounds.

ii. Deutero-Chloroform. This will provide a measure of loss for the chlorinated hydrocarbons. Chloroform is somewhere in the *middle* of the range of volatility for this class of compounds.

iii. D6-Benzene. This measures the recovery of the aromatic compounds such as BTEX and Chlorobenzene. These compounds can be lost in the gas chromatograph by adsorption onto carbonized material that tends to form near the injection port.

Section 4

DELIVERABLES

AVES will prepare a Draft Limited Soil Gas Survey Report on completion of all field and analytical work. This Report will provide the following information:

- Project Overview
- Site History
- Project Scope
- Methodology
- Results
- Contingency Sampling Results (if required)
- Conclusions
- Recommendations

The results will be provided in tabular form as well as delineated on a site map. Iso-concentration contour charts of detected compounds will be provided. All sample documentation, analytical laboratory forms and tables, and Quality Assurance/Quality Control forms will be provided in appendices. The report will be certified by a qualified and California registered engineer or geologist. The Draft Report will be reviewed by the client and then revised to incorporate all concerns and comments. This revised Final Report will be checked by the client and then submitted to the LARWQCB for approval.

Section 5

SCHEDULE

AeroVironment will commence work on behalf of Johnson Controls, Inc. following approval of this draft Work Plan by JCI and the Final Work Plan by the LARWQCB. The work is estimated to take a total of 4 weeks. The projected schedule for implementing the Work Plan is as follows. Elements of the Contingency Plan are provided in bold.

Week 1

1. Notice to Proceed - Project Kick off meeting	Day 1
2. Mobilization of Staff/Equipment/Driller and marking and clearance of all sampling sites	Days 2-3
3. Installation of 28 soil gas sampling probes at 5, 10, 15 and 20 feet bgs, as required at 22 locations	Days 4-5

Week 2

1. Sampling of 28 soil gas sampling probes at 5, 10, 15 and 20 feet bgs at 22 locations	Days 1-2
2. If required, install additional sampling locations in accordance with Contingency Sampling Plan	**Days 1-4**
3. In required, sample and analyze additional (Contingency Plan) probes	**Days 4-5**
4. Documentation and analysis of 28 soil gas samples	Days 1-3
5. If required, documentation and analysis of additional (Contingency Plan) soil gas probes	**Day 5**
6. Preparation of data tables and graphics for Draft Survey Report	Days 3-5

Week 3

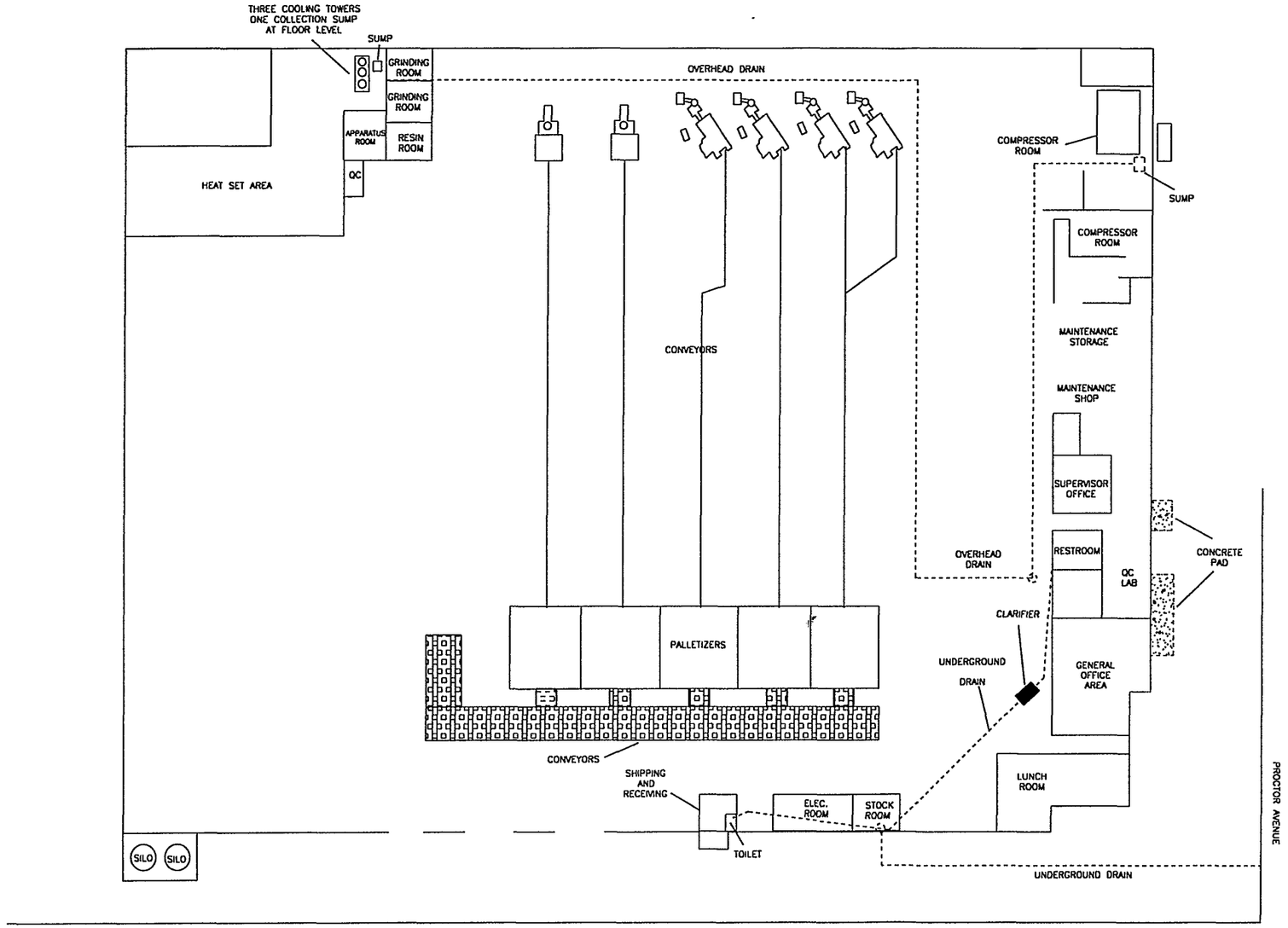
1. If required, documentation and analysis of additional (Contingency Plan) soil gas probes	**Day 1**
2. Finalize Draft Limited Soil Gas Survey Report and submit to JCI for review	Days 1-3
3. Client review of report	Days 4-5

Week 4

1. Client review of report	Days 1-2
2. Review client comments and incorporate into Final Limited Soil Gas Survey Report	Days 3-5
3. Submit Final Limited Soil Gas Survey Report to RWCQB	Day 5

Attachment A

FIGURES

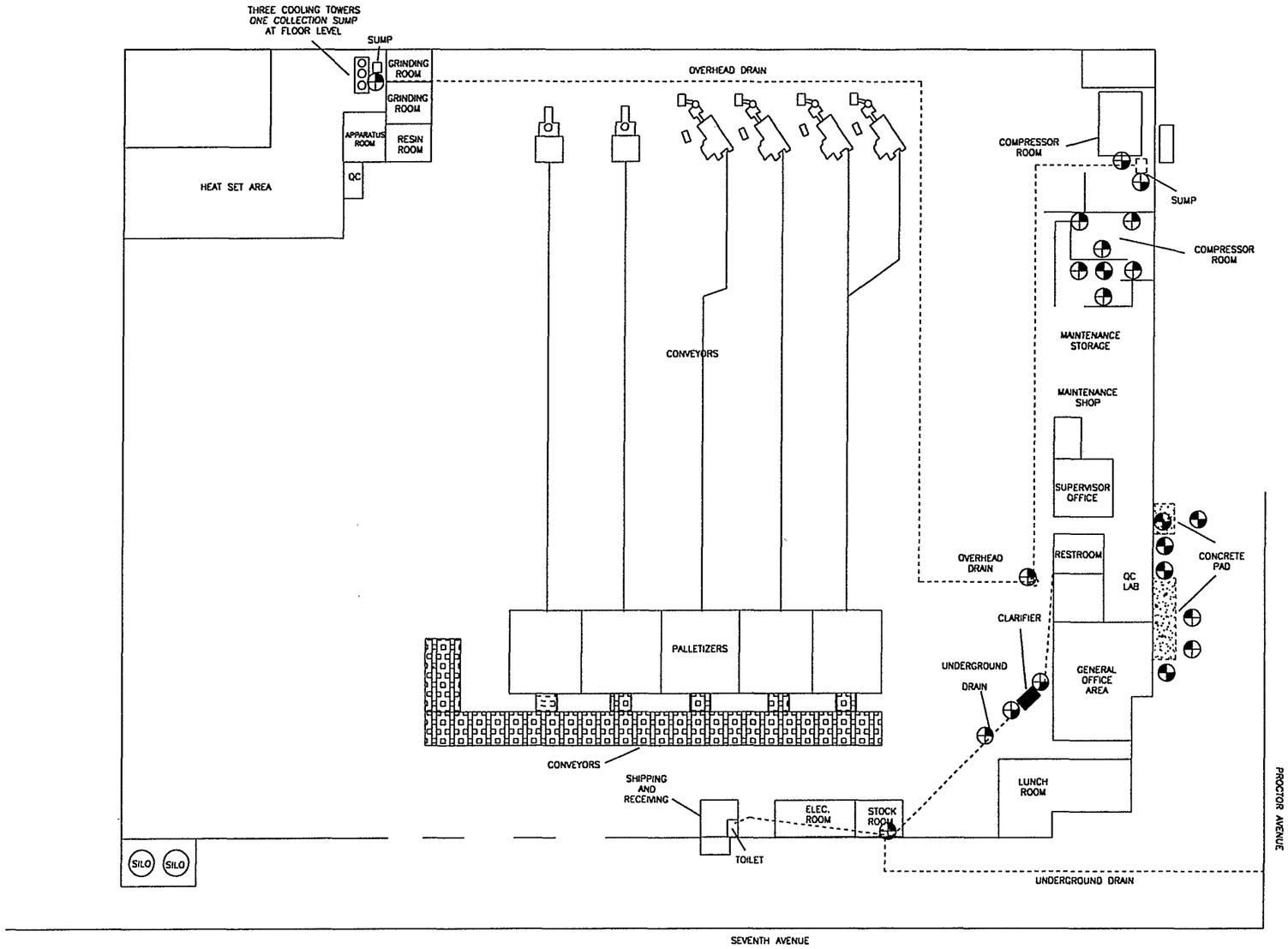


AeroVironment
ENVIRONMENTAL SERVICES INC.

SCALE: NONE	SUBJECT: SITE LAYOUT	DRAWN BY: S. BERGE
DATE: 12/05/96		PROJECT NUMBER: 301225

Johnson Control Inc.
49200 Halyard Drive
Plymouth, Michigan

Figure 1



LEGEND

- PROPOSED LOCATION OF SOIL VAPOR PROBE AT 5 FEET BGS.
- PROPOSED LOCATION OF SOIL VAPOR PROBE AT 10 FEET BGS.
- PROPOSED LOCATION OF SOIL VAPOR PROBE AT 15 FEET BGS.
- PROPOSED LOCATION OF SOIL VAPOR PROBE AT 20 FEET BGS.
- PROPOSED LOCATION OF SOIL VAPOR PROBE AT 5 AND 15 FEET BGS.

AeroVironment
ENVIRONMENTAL SERVICES INC.

SCALE: NONE	SUBJECT: SAMPLE LOCATIONS	DRAWN BY: S. BERGE
DATE: 10/25/96		PROJECT NUMBER: 301225

Johnson Control Inc.
49200 Halyard Drive
Plymouth, Michigan

Figure 2